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UNITED STATES DEPARTMENT OF AGRICULTURE



FARMERS' BULLETIN



WASHINGTON, D. C.

664

APRIL 30, 1915.

Contribution from the Bureau of Plant Industry, Wm. A. Taylor, Chief.

STRAWBERRY GROWING IN THE SOUTH.

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INTRODUCTION.

The strawberry is the most valuable of the small-fruit crops grown in the United States. In 1909 the acreage was one-half and the value—nearly 18 million dollars—was three-fourths of the total for all small fruits. This valuation is based on commercial areas and does not include the small home-garden patches, which would probably nearly double the value. The South, including the States south of the Potomac and Ohio Rivers and east of the Mississippi, together with Arkansas, Louisiana, and Texas, produced about one-fourth of the total for the United States. The average yield of strawberries per acre for the whole country was a little less than 1,800 quarts and the farm value \$125 per acre.

CHOICE OF LOCATION.

An important consideration in growing strawberries for the northern markets is to select a location where the climatic and soil conditions are conducive to the early ripening of the fruit, so there will be little competition from regions farther north. In many southern sections where strawberries are produced on a commercial scale, shipments practically cease as soon as berries from a more northern region begin to move in car lots. This is due to the fact that toward the end of the picking season the berries are small and can not compete successfully with the larger fruit from a region nearer the market that is just beginning to harvest its crop.

NOTE.—This bulletin is intended to meet the needs of all growers of strawberries in the South, more especially those who are producing on a commercial scale.

PROPAGATION.

The strawberry is propagated commercially by runners from old plants. The runner first forms leaves; then takes root. This young plant receives nourishment from the mother plant until it is capable of self-support, when the runner dies. The new plant, as soon as it is well established, often sends out runners and forms other plants. These young plants that have not produced fruit are the ones used for setting new plantations.

Propagation by seed is never resorted to except for the production of new varieties, since no one can foretell what kind of fruit will be produced by a seedling plant. All new varieties, however, come from seed, either through normal variation in the seedlings or through variation induced by crossing two distinct varieties. When two varieties are crossed for the purpose of combining their desirable qualities, the resulting seedlings will show every combination of characters, with perhaps a few possessing the desired characters of both parents. In practice, however, most new varieties come from seeds the parentage of which is not known.

SOILS FOR STRAWBERRIES.

SELECTION OF THE SOIL.

While strawberries will grow on nearly all types of soil, a sandy or gravelly loam gives the best results. In the South a warm, quick soil, although poor, is preferable to a heavy retentive soil well supplied with plant food. Plant food can be supplied by the addition of fertilizers, but the physical condition of the soil can only be modified with difficulty by cultivation, drainage, and the addition of humus. The time of ripening can be influenced to some extent by selecting soils and exposures which force or retard maturity. A light, well-drained soil with a southern or eastern exposure will hasten the maturity of the berries, while heavy moist soils with a northern exposure will tend to make the crop late. Heavy mulching will also delay ripening.

The soil for strawberries should be well supplied with organic matter (humus) in a well-decomposed state. Many growers believe that new land is essential for good results, but if old soils are well supplied with organic matter they will yield as large crops as the new soils. The main difference between old and new soils is in the supply of humus and the mechanical condition due to the presence or absence of humus. The soil should be well drained, but should hold moisture during dry weather. Organic matter in a well-decomposed state in the soil makes it retentive of moisture. In sandy soils the organic matter fills up the spaces between the soil particles and checks evaporation, while in clay soils it prevents the

soil from running together and baking and thereby prevents excessive loss of moisture by capillarity and evaporation.

A soil containing large quantities of nitrogen should be avoided, as such a soil will produce a heavy, dense growth of foliage at the expense of fruit. Weeds will be more troublesome and the fruit will not ripen as evenly on soil of this type.

PREPARATION OF THE SOIL.

The soil on which strawberries are to be grown should be thoroughly prepared, and to secure best results this preparation should begin at least a year before the plants are to be set. On weedy land a cultivated crop or one that will smother out the weeds should be grown the year preceding the planting of the strawberries. A good practice, followed by some growers, is to plant corn with cowpeas between the rows the year before the strawberry plants are set. The cultivation of the corn keeps down the weeds during the early part of the season, and the cowpeas choke them out during late summer. The cowpeas also add nitrogen and humus, both of which are important, but usually deficient in the soil. The cowpeas and corn stubble should be turned under during the fall or winter, to insure their decay before dry weather begins. In the spring the land should be plowed and then harrowed every 10 days or two weeks up to planting time, in order to kill the weeds and pulverize the soil. The plowing should be deep, so as to increase the water-holding capacity of the soil.

On level, poorly drained soils it is necessary to set the plants on raised beds or ridges. The beds should be as flat and wide as conditions will allow, for high, narrow beds dry out more quickly. The ridges or beds are commonly made by throwing together two or four furrows with a 1-horse turnplow and leveling the top with a light drag. It is much better to make the beds wide enough for two or more rows than to make one bed for each row. This practice is followed with good results in some sections of the South.

Where there is no danger in an average season that the plants will be injured by excessive moisture, flat culture gives the best results.

FERTILIZERS.

Few soils that are adapted to strawberry growing are rich enough to produce large crops of fruit without the addition of manures or fertilizers of some kind.

Stable or barnyard manure is the best fertilizer for strawberries, because it furnishes both plant food and humus; but manure containing weed seed should be avoided. The best way to enrich strawberry land is to apply manure to the crop preceding the strawberries, in order that it may decompose and become well incorporated with

the soil and so that most of the weed seeds will have germinated by the time the plants are set. If manure is to be applied the season the plants are set, only well-rotted manure should be used. After the land has been plowed the manure should be spread broadcast at the rate of 10 to 20 tons per acre, depending upon the fertility of the soil, and harrowed in.

Manure does not contain sufficient phosphoric acid and potash, and for that reason it should be supplemented by the use of commercial fertilizers rich in these elements.

When manure is not available, the plant food should be supplied by means of commercial fertilizers and green-manure crops. The commercial fertilizers will supply the plant food, but since they do



Fig. 1.—Field of strawberries planted in accordance with the hill system as practiced in Florida.

not add humus it is necessary to turn under green crops to keep the soil in good mechanical condition. Some of the best crops for this purpose are cowpeas, soy beans, velvet beans, vetch, and the clovers, as these crops will add nitrogen in addition to the humus. When phosphorus and potash are necessary, they can usually be supplied most economically in acid phosphate and muriate or sulphate of potash. Many growers use a high-grade complete fertilizer, but as a rule better results can be secured if a part of the nitrogen is supplied by means of leguminous crops or manure.

If neither manure nor legumes are available, a complete fertilizer should be used, but a maximum crop can not be secured in this way unless the soil is in perfect mechanical condition. In some sections of the South a ton or a ton and a half of high-grade fertilizer per acre is used, but this quantity is not economical. If 1,000 or 1,500

pounds of fertilizer will not produce large crops, the soil is either not suited to strawberries or is deficient in humus. Large applications of fertilizer will not make up for the lack of vegetable matter or humus in the soil. Heavy applications of fertilizers are profitable only when used on soils in a good physical condition and well supplied with humus.

When a commercial fertilizer is used in large quantities, two or more applications should be made. The first application should be made before the plants are set, and it may be scattered broadcast or under the rows; later applications may be made during the growing season as side dressings. When as much as 1,000 pounds is used at the first application it is advisable to scatter it broadcast; smaller quantities should be applied in the furrow and thoroughly mixed with the soil. If all the elements are to be supplied by means of commercial fertilizers, a mixture containing 3 to 4 per cent of nitrogen, 6 to 8 per cent of phosphoric acid, and 6 to 8 per cent of potash will be satisfactory. In the South cottonseed meal, acid phosphate, and muriate of potash are the fertilizers most often employed. A mixture containing 800 pounds of cottonseed meal, 800 pounds of acid phosphate, and 250 pounds of muriate of potash gives the elements in about the right proportion for the lighter soils. Apply this at the rate of 800 to 1,500 pounds per acre, depending upon the fertility of the soil. If the soil contains a great deal of potash, part of the muriate of potash may be left out; on soils that make a good growth of foliage it will not be necessary to use as large a quantity of cottonseed meal. Where fish scrap or tankage can be secured to better advantage, 600 pounds of the former or 500 pounds of the latter can be substituted for the cottonseed meal.

SYSTEMS OF GROWING.

There are three systems of growing strawberries: The hill system, the matted-row system, and an intermediate between the two, sometimes known as the hedgerow system.

THE HILL SYSTEM.

In the hill system the plants are set in hills (fig. 1), one plant in a place, and no new plants are allowed to form. This makes a large, vigorous plant, producing large, uniform berries which ripen evenly. This is the system that is followed in Florida. One reason why the hill system is used in that State is undoubtedly because it is necessary to take advantage of as much sunlight as possible in order to properly color and mature the berries during the short days of the ripening season. The berries would be more shaded if other systems were used, and with the short days and the large amount of humidity in the air they would not color well and many would rot on the vines.

The high cost of growing the fruit in Florida and the heavy transportation charges to the northern markets make it important to secure the greatest possible percentage of large, well-ripened berries, and this can be done under the hill system. The quantity of berries that can be produced by following this system is not always so large as under the other systems, but the quality is much better, and the percentage of first-class berries and the prices received are higher than under the other systems.

THE MATTED-ROW SYSTEM.

In the matted-row system (figs. 2 and 3) the runners are allowed to set plants 6 to 9 inches on either side of the row. If the belt of plants



FIG. 2.—Field of strawberries, showing the system of very wide matted rows used in some sections of the upper South.

is to be as wide as 18 inches, the rows should be at least $3\frac{1}{2}$ feet apart, in order to allow room for cultivation. A larger quantity of berries is grown under this system than under any other, but the fruit is usually smaller and does not ripen as well. The percentage of high-class fruit is lower in the matted rows than when the hill system is followed, but the work of cultivation and thinning is less than under any of the other systems, and for that reason it is used by most growers. Most of the growers who use this system allow their fields to bear for two or more years, and in order to renew the patch they often cultivate the middles and induce new runner plants to take possession of them. After the middles are well stocked with plants, the old rows are turned under and form the alleys between the new rows.

THE HEDGEROW SYSTEM.

The hedgerow system is intermediate between the hill and the matted-row systems, and has some of the advantages of both. In the hedge-row system (figs. 4 and 5) the runners are allowed to form plants along the row in a strip a few inches wide. After this strip is well stocked with plants the runners are cut off. The advantage of this over the matted-row system is that more air and sunlight reach the fruit, resulting in larger and more uniform berries. More berries are produced by using the hedgerow than by the hill system. This is the system most commonly practiced in the southern part of the lower tier of Southern States with the exception of Florida.



FIG. 3.—Field of strawberries set in narrow matted rows with a mulch between.

In some cases the field is plowed after one crop has been produced, and in others it is allowed to bear for two or more years.

In Florida the hill system gives the best results, while in most other sections either the hedgerow or matted-row system is preferred. Where large berries with the best table qualities are more important than heavy yields, the hill system should be used. In most commercial plantings a heavy yield is of prime importance, and the hedgerow or matted-row system should then be employed, except where climatic and other conditions do not favor these methods, as in Florida.

PLANTING STRAWBERRIES.

TIME OF PLANTING.

The time to plant strawberries varies in different sections of the South. In Florida they may be set at any time from June to November whenever the soil and weather conditions are favorable. In the

southern sections of the South Atlantic and Gulf Coast States the plants are set out in late summer or autumn. In both cases the crop is harvested the following spring. In other sections of the South the plants are set in late winter or early spring and the crop is not harvested until the following year. Plants set out in the spring and not expected to carry a crop until the following spring should have the blossoms kept off during the summer, so that the vigor of the plants will not be impaired.

SOURCE OF PLANTS.

Many growers use young plants from the old beds for setting new plantations, while others buy from plant dealers. The first method is



FIG. 4.—Field of strawberries planted according to the wide hedgerow system.

satisfactory if only strong and healthy young plants are selected; old plants that have produced fruit do not give good results and should never be used. A practice followed in many sections is to cultivate and fertilize the fields after the berries are harvested, in order to get a good growth of runners. When the young plants reach the proper size for planting they are taken up and set out in the new fields. This is a good practice and should be generally followed where plants from the old patch are used. Plantations that do not produce fruit make stronger plants for setting than those that produce both fruit and plants.

PERFECT AND IMPERFECT FLOWERS.

Some varieties of strawberries have both stamens and pistils (male and female organs) and are called "perfect flowered," while others have only pistillate (female) flowers. When planting strawberries

the grower should give careful attention to this point, for pistillate plants will be unproductive when planted alone. When varieties with only pistillate flowers are selected they should be planted with perfect-flowered varieties. A common practice where imperfect varieties are used is to plant one row of perfect-flowered varieties to three or four rows of imperfect, or pistillate, plants. In such a planting system the pollen from the perfect flowers fertilizes the imperfect blossoms. Figure 6 shows perfect and imperfect flowers. When the flowers are not properly pollinated, the result is a large number of nubbins or deformed berries. Sometimes during the blossoming



FIG. 5.—Field of strawberries planted in accordance with the hedgerow system, at the beginning of the blossoming period in Louisiana.

period conditions, such as frost or heavy rains, prevent perfect pollination even when the varieties are perfect flowered.

METHODS AND DISTANCE OF PLANTING.

The distance to set the plants depends upon the methods of culture to be followed. In sections of Florida where the plants are grown in hills they are set 12 to 14 inches apart in rows 3 to 3½ feet apart. In southern Louisiana they are set about 10 inches apart in rows 3 to 3½ feet apart. In most other sections of the South the plants are set 15 to 18 inches apart in rows 3½ to 4 feet apart. Some growers set the plants in checks 3 by 3½ feet and cultivate both ways until runners begin to form. This is satisfactory if the plants have a full year in which to grow new plants for bearing fruit and is the best method for those varieties which are prolific plant makers.

Several methods are followed in setting plants in the field. A good method is to use a spade to open the hole. One man thrusts the spade into the soil and moves the handle forward, thus opening a broad hole. A second man spreads the roots of the plant in fan shape, places them in the hole, and packs the soil with his foot after the spade is withdrawn; or the spade may be inserted about 6 inches in front of the plant and the soil pressed against the plant by a backward movement of the handle. Another method sometimes followed is to open a furrow with a 1-horse turnplow, set the plants against the land side, and pull the loose dirt up to them. In a third method the hole is made with a dibble. This is not very satisfactory, because the plant can not be placed in a small round hole without matting and cramping the roots. Some growers have secured very good results with a plant-setting machine which waters the plants as they are set. If the soil is dry, a small quantity of water should be poured around each plant at the time of setting, no matter which method is used. After

the water sinks into the ground a little dry soil should be pulled up around the plant to prevent the haking of the soil.

The greatest care should be exercised to set the plants so that the crown is just above the surface of the soil. If set too shallow the roots will dry out



FIG. 6.—Perfect strawberry flowers (1 and 2) and an imperfect flower (3).

by being exposed, and if too deep the crown or terminal bud will be covered with soil and will not grow. Before setting the plants the roots should be pruned back one-third or one-half their length, so they will not be cramped. Most of the top should also be removed, to prevent excessive loss of moisture through the leaves. Not more than two or three of the youngest leaves should be left.

CULTIVATION.

Clean, shallow cultivation should be followed throughout the season. Good cultivation keeps down the weeds, allows the rains to penetrate the soil, and prevents the excessive evaporation of moisture. Cultivation should begin soon after the plants are set and should be continued whenever weeds start or a crust forms. The main objects of cultivation are to break up the crust and to prevent the loss of moisture from the soil below the surface, which is accomplished by forming and maintaining a blanket of loose soil on the surface. Frequent shallow cultivation will make it unnecessary to use a sweep to kill weeds and grass, which is often necessary under the methods of culture now in common use in the South. A culti-

vator which merely breaks up the surface of the ground without disturbing the roots is to be preferred. In addition to using the horse cultivator it will be necessary to do some hand hoeing, to keep down the weeds and to keep the soil loose between the plants in the row. Weeds will sometimes have to be pulled by hand, and they should never be allowed to become large, because when large weeds are removed the strawberry plants will be disturbed.

MULCHING.

Mulching is a very important operation in connection with strawberry growing, as it prevents the excessive loss of moisture, prevents "heaving out" in regions where freezes occur, keeps the berries clean, keeps down weeds, retards growth in cold regions (thus preventing frost injury), and adds humus to the soil. The important objects of mulching in the South are conserving moisture, protecting the berries from dirt, and keeping down weeds. Mulched plants are said to suffer less from spring frosts than those in the same area not mulched. Strawberries are not usually cultivated during the picking season, because stirring the soil tends to make the fruit dirty and gritty; but unless the plants are mulched they are apt to suffer from drought, which often occurs at this season, causing a serious reduction in yield. There would not be as much loss due to drought if the plants could be kept cultivated during the picking season, but as cultivation is objectionable, mulching is a very effective substitute.

MULCH MATERIAL.

There are many materials that can be used for mulching, but their value depends largely upon their freedom from weed seeds. Wheat, rye, and oat straw, strawy manure from the horse stable, pine straw, and marsh hay are the materials most commonly used. All of these are satisfactory when they can be secured in sufficient quantity and are free from weed seeds or grain. Pine straw is the best material to use so far as ease of application and keeping the berries clean are concerned, but it is not as valuable a source of humus as the other materials and can not be secured in all regions.

TIME OF APPLYING MULCH.

The mulch should be applied during the late fall or winter whenever the soil will not be injured by driving on it. A sufficient quantity should be used to conserve the moisture and to protect the berries from dirt by keeping them off the ground. A mulch 2 or 3 inches thick is adequate for this purpose. If there is no mulch between the rows the soil should be cultivated before picking begins. Even when there is a mulch it is a good plan to remove this material and cultivate; it can then be replaced.

DURATION OF PLANTATION.

The length of time that a field should be allowed to produce fruit depends upon many conditions and varies in different sections of the South. In sections where weeds and grass grow very rapidly, where the picking season is long, and where the fields become foul during the harvesting season, one crop is all that should be grown. Under these conditions it costs quite as much to clean out the old plantation as it does to make a new one, and a new planting nearly always yields a larger and better crop.

In most sections, with the exception of the extreme South, where strawberries are grown under the hill system and a new planting is made each year, the plants are allowed to bear for two years or more. Two crops under most conditions should be the maximum. In some regions the fields bear as many as six crops before being renewed, but in nearly every instance where this practice is followed the crops are not satisfactory after the second year. It is possible to clean up the patch each year in such a way that large crops can be secured for a period of five or six years, but very few growers give the field the attention necessary to produce large crops of first-class fruit. In most cases the berries are small and of inferior quality after the second year, because of the crowding of the plants and the poor physical condition of the soil.

Where the fields bear more than one crop, they should be thoroughly cleaned out, thinned, cultivated, and fertilized after the fruit has been harvested. Most growers do not give the fields the needed attention. It is just as necessary to give good cultivation and to add fertilizer during the second season as it is during the first. When this is properly done a good crop will be produced the second year. The best quality of fruit is nearly always produced on the new planting, however, and for this reason frequent renewal is recommended. One argument against planting every year is that the land is used two years and only one crop is produced. This is usually the case where the plants are set out in the spring, but a crop of late Irish potatoes or some other vegetable can be grown after the strawberries have been harvested and two crops secured in this way. In some sections where strawberries are planted in the spring, they are interplanted with crops like potatoes, peas, or beans. If the plants are set in the late summer or autumn a crop of early vegetables can be grown before the strawberry plants are set. Better results can be secured, however, where cowpeas, soy beans, or some other leguminous crop is grown and turned under.

RENEWING OLD BEDS.

When strawberries are grown under the hill system, the usual practice is to make a new planting each year, but under the other systems the old beds are often renewed. When old plantations are

to be kept over, the fields should be mowed soon after the berries are harvested and the tops and weeds burned. This burning will destroy many insects and diseases and will not injure the plants if done on a windy day when the field will burn over quickly. After the tops and weeds have been burned, thorough cultivation should be given between the rows and the plants thinned by removing the old plants, in order to allow the new ones to form runners. A good practice followed by some growers is to plow out part of the row and allow the runners from the remainder of the row to cover the cultivated section. When the new portion is well stocked with plants the old portion should be turned under. Whenever the plantation is kept for more than one year the soil should be fertilized and cultivated as for a new planting.

ROTATION.

A systematic rotation of crops is just as important in growing strawberries as it is in growing other crops, but very few growers practice it to any great extent. Soil on which strawberries are raised year after year does not produce as large crops of fruit as it would were a good system of rotation followed. In any system of rotation some leguminous crops should be grown and turned under one year in every three or four years, and a cultivated crop grown on the soil the season before the strawberry plants are set.

For the South the following system can be employed to good advantage: Strawberries for one or two years, followed by cowpeas after the strawberries are harvested. Turn under the cowpeas in the fall or winter or harvest them for hay. The next spring plant the land to some vegetable crop, such as early cabbage, and follow with a fall crop of vegetables or cowpeas for turning under. Plant the land to corn the following spring and plant cowpeas between the rows. After the corn is harvested, turn under the stalks and the pea vines. When strawberries are planted in the fall, they can be set out after the cowpeas and cornstalks are turned under. A second system that can be followed is strawberries one or two years, followed by a fall crop of vegetables after the berries are harvested. The next spring plant to vegetables, and follow with cowpeas, and then either plant strawberries again or grow corn and cowpeas followed with strawberries. In sections where vegetables are not grown commercially, oats can follow the cowpeas that are turned under the season the strawberry field is plowed, and either cowpeas or peanuts can follow the oats. The following year plant the land to corn, with cowpeas between the rows; then return to strawberries. By following a good rotation system, such as has been suggested, the yield of strawberries will be greatly increased and the cost of cultivation lowered.

HARVESTING STRAWBERRIES.

PICKING THE FRUIT.

The stage of maturity at which berries should be picked depends upon the distance they are to be shipped. When grown for a local market they should be picked when thoroughly ripe but not soft. If grown for a distant market the berries must be picked before they are thoroughly ripe, but they should be fully grown and about three-fourths ripe. If picked before they are colored the berries will shrink and wither, making them unfit for sale. Strawberries should be picked with a short piece of stem attached (about one-fourth to one-half inch). They should never be slipped from the



FIG. 7.—American quart boxes of well-graded strawberries: "Fancy" on the right, "No. 1" on the left.

stem, as that spoils their appearance and injures their shipping and keeping qualities.

PACKING THE FRUIT.

Uniformity in the pack is essential in order to obtain high prices for strawberries, and this can be secured only when the berries have been carefully graded and sorted. Some growers have the berries graded in the field. The pickers carry several boxes in the picking tray and as the berries are picked they are graded according to size, the different grades being put in separate boxes. This method is satisfactory when experienced pickers are employed, but with the average help that can be secured it is best to have the grading done in a packing shed by a few expert graders and packers. This work is generally done by women.

A common practice in some sections is to pick the ripe berries of all grades into the same box and when the tray is full to take it to the packing shed, where the berries are sorted and packed. The graders dump the berries on a table and pick out all green, overripe,

or small berries. The others are placed in the boxes, one of the graders arranging the top layers in such a way that the berries show to best advantage. When berries are packed in this manner, care should be taken not to put the small, inferior berries in the center of the box and the large fine berries on top. The fruit should be uniform throughout the box, with the top layer merely placed to add to the attractiveness of the pack and to hold the fruit in place. Where a fancy pack is put up, the berries should be divided into two grades, as shown in figure 7.

After the berries are picked they should be placed in the shade as soon as possible, for heat injures the fruit in a short time. The pickers should not be allowed to leave the filled boxes along the



FIG. 8.—Crate of Aroma strawberries in octagon quart boxes, 24 quarts to the crate.

rows, where the berries will be exposed to the sun. The shorter the time that elapses after the fruit is picked before it is put into refrigerator cars or refrigerator boxes the better it is for the berries, which will continue to ripen rapidly until they are chilled.

PACKAGES.

Many different types of boxes and crates are used for strawberries, but the tendency is toward a standard full-size quart box. In fact, in several States it is illegal to offer for sale a short box; shipments to these markets must be handled to conform with the laws. The boxes now in use are the American or standard quart berry box, which holds a full quart; the octagon box, shown in figure 8; and the square scalloped type of quart and pint boxes, shown in figure 9. The American type, shown in figure 7, is the one that is most generally used; it is full size, strongly made, and packs well in the

crate. The octagon box, shown in figure 8, is objectionable on account of its shape and the raised bottom. A long, narrow box is not satisfactory, because it is inconvenient to pick up without grasping the sides between the thumb and fingers, and when handled in this way the berries are likely to be mashed. Moreover, the sides of boxes with raised bottoms often split off below the bottom, causing the boxes to tip over. The scale-board boxes are cheaper than splint boxes, but as the latter are more substantial they are preferred in nearly all markets. The type of crate depends on the boxes that are used. Any crate that is substantially built and well ventilated is satisfactory, but cost is an important consideration, as



FIG. 9.—Crate of well-graded Klondike strawberries packed in square pint boxes with raised bottoms, 24 pints to the crate.

they are not returned to the shipper. The largest crate that can be handled conveniently is the one to use, as the large ones are cheaper in proportion to the quantity of berries they carry. The 24 or 32 quart crates are generally used, though in some sections the 60-quart crate is employed. Crates with hinged lids have an advantage over others in that they provide for the inspection of the fruit to better advantage. The hinged-lid crate invites inspection and this is a point in its favor.

A large part of the strawberry crop grown in Florida is shipped to northern markets in refrigerator boxes similar to the one shown in figure 10. These boxes, or pony refrigerators, hold 64 or 80 quarts of berries. After the boxes of berries are placed in the refrigerator a metal tray (fig. 10) is put in place above the berries and filled with ice. The main advantage in using these refrigerator

boxes is in long-distance express shipments where refrigeration is necessary.

In order to bring the highest market price berries must be well graded and sorted, carefully packed, and put up in clean, neat, attractive packages of standard size. Figure 11 shows a good type of crate holding 32 full quarts of well-graded fruit. The grower should see that the berries are honestly and conscientiously graded and put up uniformly throughout the package.

VARIETIES OF STRAWBERRIES.

The varieties of strawberries that are grown in any given region change so rapidly that a list suitable for this year would need to be

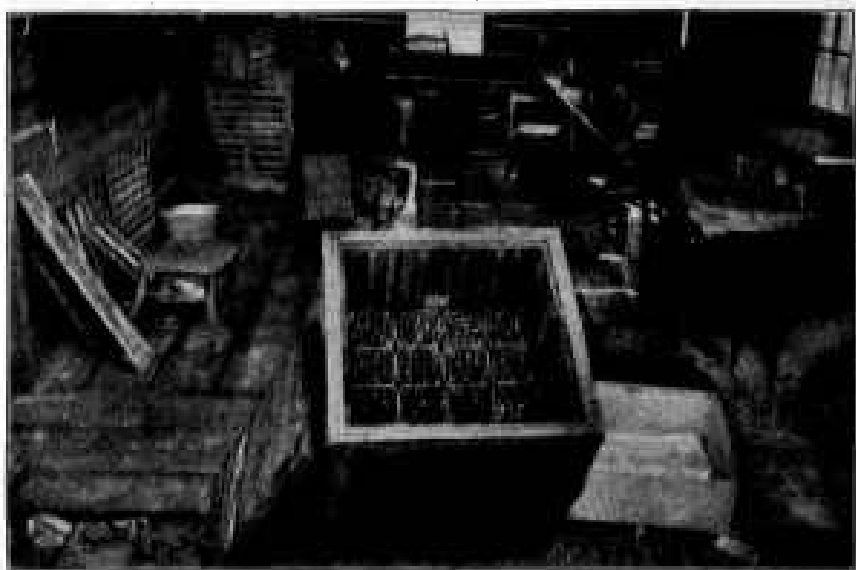


FIG. 10.—Pony refrigerator used in Florida for express shipments of strawberries to northern markets. The lee tray is on the floor to the right of the refrigerator.

revised in a few years. While some of the best varieties grow well in many localities, others are of local adaptation. The question of the variety or varieties to grow depends upon many factors. What would be considered a good variety for a home garden might not be at all suited for distant markets. A good market variety should be a heavy bearer, of good size and attractive appearance, and, above all, one that stands shipment well. Such a variety may not be of first-class quality. For the home garden, quality is the first consideration, while the carrying quality need not be considered. In the home garden there should be a succession of crops from early to late, while in a commercial plantation the season of the variety or varieties grown is determined by the markets. As a rule, the com-

mercial grower plants only one variety, or a few varieties at most, and these are usually selected with the purpose of reaching the market at a time when there is the least competition from other sections. For this reason many of the regions of the South grow the same varieties and depend upon the difference in the season of maturity to prevent competition with each other. If early, medium, and late varieties were grown, the late variety in the southern regions would compete with the early variety in the sections a little farther north.

In the South at the present time the varieties considered the best for commercial purposes are the Klondike, Lady Thompson, Mission-



FIG. 11.—Crate of well-graded Missionary strawberries in American quart boxes, packed in a ventilated crate holding 32 quarts.

ary, Excelsior, and Aroma, the first-named being grown more than any other variety. Where a succession of crops is desired, the Excelsior is grown for an early variety; the Klondike, Missionary, or Lady Thompson for medium, and the Aroma for later ripening. In Florida at the present time the Missionary is the most popular variety, but the Excelsior and Klondike are also grown. In Georgia, North Carolina, and South Carolina the Lady Thompson, Klondike, and Excelsior are the most popular varieties. In Louisiana, Arkansas, and Mississippi the Klondike is grown more than all other varieties, though in Arkansas some commercial growers use the Lady Thompson, Excelsior, and Aroma. In the Ozark section of Arkansas and Missouri the Aroma is the most popular variety, although the Klondike

dike is also grown to some extent. In the commercial strawberry-growing region of western Tennessee, the Klondike, Excelsior, and Gandy varieties are grown. The strawberry section of eastern Virginia uses the Klondike, Excelsior, Missionary, and Early Ozark, the first named being the leading variety.

COST OF GROWING STRAWBERRIES.

The cost of growing strawberries varies between wide limits, depending upon the locality and the methods of culture. In most sections of the South the average cost of production is \$75 to \$90 per acre, but in some places the cost is very much higher, especially in Florida.

Below is an estimate of the cost per acre of growing strawberries in the South:

Interest on investment in land and equipment.....	\$8 to \$15
Preparation of land.....	5 to 10
Manure or fertilizer.....	10 to 25
Plants.....	10 to 20
Setting plants.....	8 to 12
Cultivating and hoeing.....	20 to 35
Mulching.....	15 to 25
Total for growing the first year.....	76 to 142
Picking, grading, and packing 2,000 quarts.....	40 to 70
Crates and boxes.....	20 to 25
Hauling to station, etc.....	5 to 10
Total for picking, packing, grading, etc.....	65 to 105
Total for growing.....	76 to 142
Grand total.....	141 to 247

The lower estimate is about the average for most sections of the South, while the higher figures cover the extreme cost of production. The average cost in Florida is between these two, but nearer the higher estimate. It should be borne in mind that in these estimates the interest on the investment and all labor costs are included. Where the grower does not fertilize or mulch his crop the cost should be lower than given in the estimates. It is the farmer who secures more than the average yield who makes a success in growing strawberries, while those who produce less than the average for the region are losing money, if interest on the investment and the labor of the growers are considered. With a yield of 3,000 quarts to the acre, which is the average of many growers, there is a good profit in growing strawberries. Yields of 4,000 and 5,000 quarts to the acre are not uncommon.

When the plantation is kept for more than one year the cost of production is lowered, because there is no outlay for plants, preparation of the soil, or planting, as in the first year. The cost of fertiliz-

ing and cultivating an old plantation should be as much as for a new one. The average upkeep for the second year should not exceed \$40 or \$50 per acre.

STRAWBERRY BY-PRODUCTS.

Each year thousands of bushels of strawberries go to waste in the larger producing centers of the United States because of low prices or some adverse condition. In many regions of the South 20 to 25 per cent of the crop is never gathered, because the prices toward the end of the season are too low to justify picking the fruit. This is a great loss that should be avoided. With the increasing demand for strawberry products, such as crushed fruit, jellies, preserves, and marmalades, this loss can be greatly reduced.

Within the last few years some of the manufacturers of food products have been putting up fresh strawberries in large quantities for use at soda fountains and in the manufacture of ice cream. This industry can be developed into one of great importance to the producer, manufacturer, and consumer. Several large manufacturers buy surplus strawberries and put them up in the field, while others ship the fruit to their home factory. One of the best methods of handling the fruit is as follows: Wash the berries thoroughly in cold water, put them into tight barrels with sugar in about equal weights, load in refrigerator cars, and ship to a cold-storage plant where they can be held until needed. Sometimes the berries are crushed before being put into the barrels, but in most cases they are packed as nearly whole as possible. When ready for use they are taken from storage and manufactured into the various products. If the fruit is in good condition at the time it is placed in cold storage it can be kept for a long time without to any great extent losing its flavor and fresh color.

The keeping of strawberries under refrigeration is a comparatively new undertaking, but results that have been secured indicate that in time this can be made an important industry. It is possible to keep the fruit in such a way that its quality is practically unimpaired. In a single storage house that has come under the observation of the writer 6,000 barrels of crushed sugared strawberries were held at a temperature between 36° and 40° F. Proper storage is an important matter, for it will enable the grower to dispose of his surplus crop and at the same time will provide the consumer with a wholesome strawberry product throughout the year. When growers are banded together into a large association it often should be possible for them to manufacture strawberry by-products at the producing center under the management of the organization.